

Welcome!

Open Consultation on Metrology for Smart Electricity Grids

Stakeholder sessions for
the EMN for Smart Electricity Grids

16 & 25 NOVEMBER | 1 DECEMBER 2021

EUROPEAN
METROLOGY
NETWORKS



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Some housekeeping

- The meeting will be recorded to facilitate summarizing the discussion outcomes
 - *Only the presentations will be made public, so feel free to comment!*
- Please turn your cameras on...
- ... but mute your microphone when you are not speaking
- Use the 'raise hand' function if you want to ask a question
- Use the chat to give comments, ask questions and raise issues

Smart Grid measurement challenges

3 discussion sessions each with a slight specific focus

- *16 November, 10 am CET* *DC grids and HV testing*
- *25 November, 10 am CET* *Digital transformation and cybersecurity*
- **1st December, 10 am CET** **Measurement of grid signals**

Agenda

Time (CET)	Item
10:00	Welcome
10:05	Measurement needs identified via a recent stakeholder survey
10.15	Keynote on Measuring power grid signals in the presence of reduced system inertia by Prof. Mario Paolone, Ecole Polytechnique Fédérale de Lausanne
10.35	Forum discussion on metrology needs for Measurements of grid signals and other smart grid measurement challenges
11.45	Wrap up
12:00	End of the meeting



**SMART ELECTRICITY
GRIDS**

**EUROPEAN
METROLOGY
NETWORKS**

Strategic Research Agenda Stakeholder Survey

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Strategic Research Agenda

EMN SEG Strategic Research Agenda

Draft version 1.0 (11/2020)
For approval BoD

DRAFT European Metrology Network Smart Electricity Grids

Strategic Research Agenda

Guiding future R&D along stakeholder needs

- 1st draft prepared based on existing knowledge of stakeholder needs
- Feedback loop including stakeholders

[Link to Strategic Research Agenda >>](#)

9 Themes of the SRA



Revenue
Metering



Power Quality



Grid Monitoring
& Data Analytics



Digital
Substations



Instrument
Transformers
and Sensors



High-Voltage
Testing



Efficiency



DC Grids and
Applications

and “Grid Integration”

Measurement challenges for each SRA theme



Digital Substations

4.4 Digital substations

Future electrical power grids will require real-time control and monitoring systems to meet increasingly complex and challenging conditions. Digital instrumentation will slowly substitute conventional analogue instrumentation. New standards in the IEC 61869 series address the digital communication of electronic instrument transformers, as well as stand-alone merging units (SAMUs) and digitisers for analogue instrument transformers. Following the introduction of these new standards, the transition from traditional analogue instrumentation towards the new digital instrumentation technology is expected to gain speed, both on a transmission and distribution level. To support this change, new metrological tools and methodologies are needed as test systems for new technology.

countries. These smart meters represent a network of IoT-devices, thus requiring a high level of IT security to prevent malevolent coordinated intrusions from destabilising the grid control.

4.4.1 Some measurement challenges in digital instrumentation

- New metrological tools and methodologies for intelligent electronic devices (electronic instrument transformers, SAMU, all-digital meters and PMUs)
- Investigation of PTP or White Rabbit methods for accurate time-stamps
- Addressing IT security of smart meters at the proper level

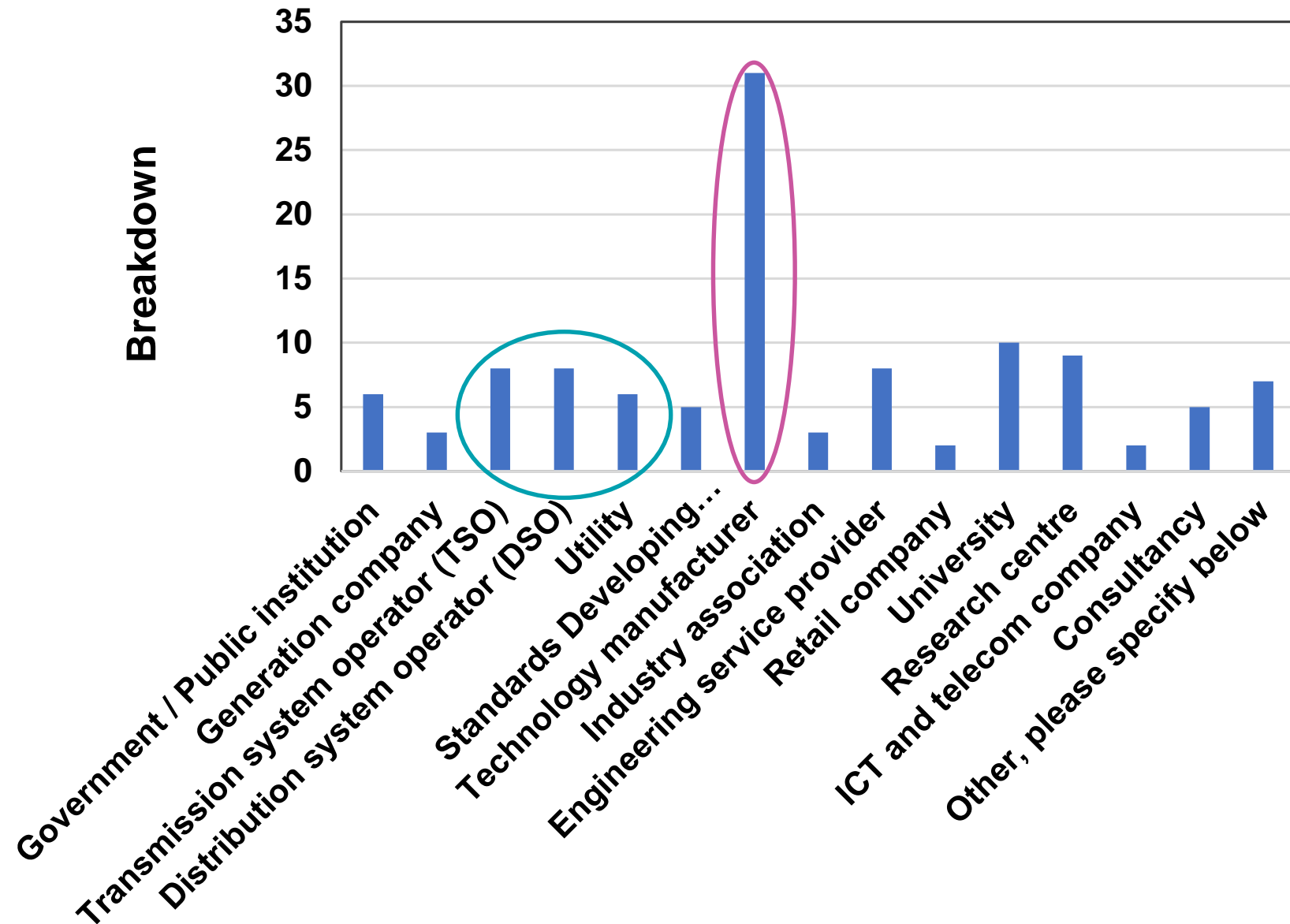


Stakeholder survey

- Stakeholders asked about the relevance of specific measurement challenges for the 9 themes
- Took place during March – April 2021
- 80 participants from 18 countries across European continent



Stakeholder survey

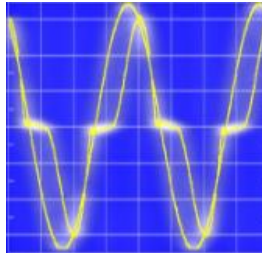


- 40 % from Technology manufacturer
- 30 % from Utilities & Network Operators
- 60 % from organisations with > 500 employees

Top 5 metrological challenges from the survey

Findings of the survey

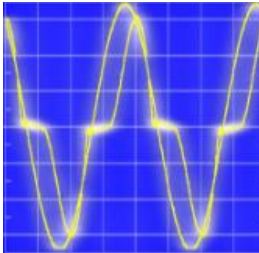
1. Fault location identification
2. Full characterisation of the frequency transfer function of instrument transformers
3. Monitoring the propagation of transient and disturbance phenomena
4. New characterisation methods for instrument transformer with PQ phenomena
5. New metrological tools and methodologies
for intelligent electronic devices



Top 5 metrological challenges from the survey

Findings of the survey

- 1. Fault location identification**
- 2. Full characterisation of the frequency transfer function of instrument transformers**
- 3. Monitoring the propagation of transient and disturbance phenomena**
- 4. New characterisation methods for instrument transformer with PQ phenomena**
- 5. New metrological tools and methodologies for intelligent electronic devices**



Grid monitoring – Top metrological challenges

1. Grid inertia measurement and characterization
2. Detection of sub-synchronous oscillation
3. Relevance of transmission-grid-like state estimation in distribution grids

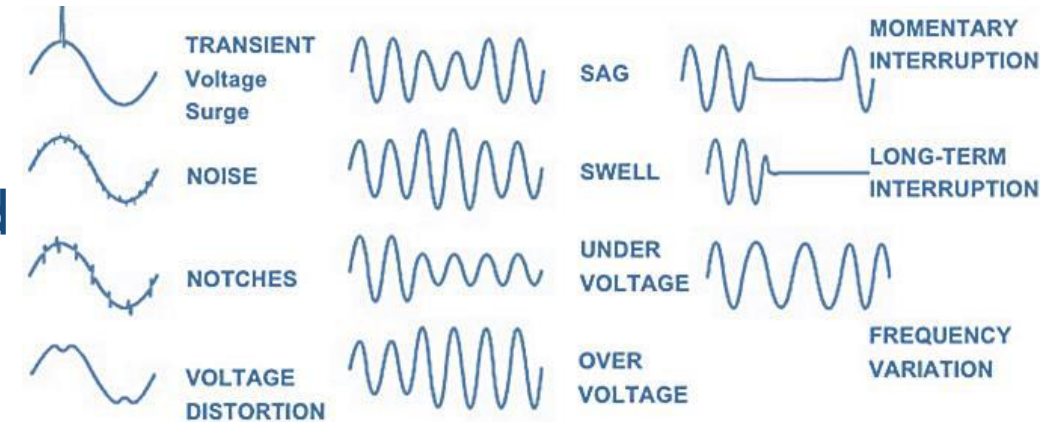
Findings of the survey



Power Quality – Top 3 metrological challenges

Findings of the survey

1. Characterisation of the frequency transfer function of instrument transformers:
propagation of harmonics and PQ phenomena
2. Standardisation comparable to IEC 61000-4-30
3. Definition of a metrological traceable grid impedance standard artefact



Keynote address

Measuring power grid signals in the presence of reduced system inertia

Prof. Mario Paolone

**École Polytechnique Fédérale de Lausanne
Distributed Electrical Systems Laboratory**

EPFL

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